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THE MOBILIZATION BASE FOR AFQT NORMS

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THE MOBILIZATION BASE FOR AFQT NORMS

The primary mental screening test used in determining whether Selective Service registrants and applicants for enlistment meet standards for military service is the Armed Forces Qualification Test (AFQT). The AFQT, developed through the joint efforts of all the services, is administered to potential enlisted input for all the services. Prospective inductees and enlistees examined in any given period are drawn from the total mobilization population of the nation.

All screening tests--and classification tests used for screening--have been geared to this mobilization population. Theoretically, the term refers to the total population of young men available for service under conditions of full mobilization (as occurred in World War II) including individuals who may later be disqualified. Selection standards established by the Congress for the purpose of rejecting those who cannot perform usefully as soldiers have been based on the concept of a mobilization population. In 1948, Congress declared that "the passing requirements for the General Classification Test shall be fixed at 70 points" (PL 759, 80th Congress, 24 June 1948). This declaration affirmed the concept, since the General Classification Test was scored in terms of the Army standard score scale derived in samples explicitly assumed to represent the "total potential Army population" (Staff, Personnel Research Section, 1945, 1947). The original standardization of the AFQT in 1949 was based on a sample of Army, Navy, and Air Force personnel selected to match the general composition of the several forces in terms of AGCT score distributions during 1944, the period of lowest mental selection requirements (Uhlaner, 1952). The cutting score established was equated to the GCT standard score corresponding to the "70 points" prescribed by the Congress.

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Similarly, when Congress declared in 1951 that "the passing requirement for the Armed Forces Qualification Test shall be fixed at a percentile score of 10 points", the concept was again affirmed, since AFQT percentile norms had been established in samples assumed to represent the "total potential military population" (PL 51, 82d Congress, 19 June 1951).

As involved in the development of successive forms of the AFQT, the term mobilization population needs clarification. The empirical base was the maximum enlisted and commissioned officer strength during World War II, taken as of 31 December 1944, that is, the total military population during peak mobilization when exemptions and deferments were at a minimum. From samples of input during 1944, distributions of AGCT scores were obtained and inflated to provide a distribution interpreted as representing the distribution of AGCT scores in the civilian pool available for service, including those who might later be rejected. In arriving at this specific definition of the mobilization population[1/], the following assumptions were made:

1/ For assumptions involved in the standardization of AGCT 1a and 1b, see Staff, Personnel Research Section, 1945, 1947.

1. That the military population as of 31 December 1944 was an unbiased representation of the civilian pool in the appropriate age bracket available for service.

2. That the military population did not differ materially from the civilian pool in such reference parameters as age, education, occupational status, and geographic distribution.

3. That the military population did not differ materially from the civilian pool in the distribution of mental ability as represented by AGCT standard scores.

4. That the 1944 input samples were unbiased representations of the total strength of all the services and of the civilian pool available for service as of 31 December 1944.

5. That the distribution of mental ability and the reference parameters would remain relatively unchanged for a number of years beyond 1944.

DERIVATION OF AGCT DISTRIBUTION IN THE MOBILIZATION POPULATION

The distribution of AGCT standard scores in the civilian pool was derived from AGCT scores in large samples of input to the services. The general procedure was to correct these distributions to account for directly commissioned officers (who were not screened with AGCT and hence not represented in AGCT input samples) and to inflate the corrected input sample distributions to provide an estimate of the AGCT score distribution in the total military population. This estimated distribution was considered to be the distribution of AGCT scores among civilians available for service.

As the first step, large samples of AGCT scores of enlisted input were obtained for each of the services. For the Army-Air Force[2], a 2% sample (n = 22,607) of the input during 1944 was used to represent total input (n = 1,130,343) for that year. For the Navy, scores on the Navy General Classification Test for the total input for the period January 1944 to February 1945 (n = 776,894) were available and were converted to equivalent AGCT scores (Staff, Personnel Research Section, 1949). For the Marine Corps, the total input (n = 104,515) for the same period covered by the Navy sample was available. The Marine Corps used the AGCT, and therefore no further conversion of scores was necessary. In this manner, a distribution of 904,016 AGCT scores was assembled to serve as the base for estimating the distribution in the civilian pool.

To provide the estimated distribution for the total military population, it was necessary to add the estimated distribution of scores for directly commissioned officers. Several assumptions were made: (1) that the distribution of AGCT scores for directly commissioned officers would be essentially similar to the distribution for enlisted men with AGCT standard scores of 110

2/ The Air Force was a part of the Army during this time; hence separate samples were not obtained. Sample sizes reported are from research files, not official documents.

and above in the same service; (2) that directly commissioned officers were essentially similar in quality to enlisted men selected for Officer Candidate School which required a minimum AGCT score of 110; and (3) that the proper correction to be applied to the frequencies in each interval above AGCT score of 110 was the ratio of directly commissioned officers to enlisted men in each service.

The corrected distributions of the input samples were then inflated to provide the distribution in the total military population as represented by the total strength as of 31 December 1944. This was accomplished by correcting each interval in the input samples of each service by a factor representing the proportion of that service in the total military strength. Official strength data, shown in Table 1, were the source for determining the size of the total military population. In the development of the various forms of AFQT, a figure of 11,694,229 has been used as the size of the total military population. This total is slightly inflated since the total number of officers commissioned from the ranks (731,123) was already included in the total number of enlisted men. A later revision of strength accounting showed the total strength of all the services, excluding the Coast Guard, to be 11,729,488 as of 31 December 1944, with maximum strength (12,124,418) in May 1945. There is no known reason to expect this revision to affect materially the estimated AGCT distribution in the civilian mobilization population.

Table 1

STRENGTH OF ARMED SERVICES AS OF 31 DECEMBER 1944

Source: Uhlaner, 1952

Service	Officers			
	Enlisted Men	Directly Commissioned	Commissioned from Ranks	TOTAL
Army-Air Forces	7,127,897	220,543	619,940	7,968,380
Navy	2,735,270	293,268	82,716	3,111,254
Coast Guard	147,865	11,707	480	160,052
Marine Corps	414,561	11,995	27,987	454,543
Total	10,425,593	537,513	731,123 (see text)	11,694,229

The resulting distribution of AGCT scores was negatively skewed (Table 2). This skew was to be expected as a result of the proportionately large number of easy items in the AGCT. The skew could also be the result of failure of many examinees to maintain the underlying skills after completing their compulsory education. More generally, the underlying abilities may not be normally distributed. However, distributions of overall test scores such as are provided by the AGCT are inadequate as a basis for testing such a hypothesis. It is possible that the specific abilities represented by the several content areas (verbal, arithmetic, spatial) are not uniformly distributed, and that the distribution of total test scores represents the algebraic effects of the divergent distributions. Fragmentary evidence suggests substantial differences among distributions of subtest scores and between them and the distribution of total test scores.

If such should prove to be the case, important questions could be raised as to the concept and methods of measuring item and test difficulty. Greater differential validity of cognitive aptitude tests may not be possible without the resolution of such questions.

CURRENT INPUT DISTRIBUTIONS

Samples of current input to the military population should not be expected to reproduce the reference test distribution in the civilian pool available for service during mobilization. For one thing, samples show expected fluctuations. For another, the effects of recruiting programs distort the distribution. Further, Selective Service deferment policies during peacetime differ from those during mobilization. In recent years, one major effect of deferment policies has been to withhold from preinduction examination substantial numbers of the more able men. ROTC students, upon graduation, fulfill their obligation for military service as commissioned officers, not as enlisted men. College students are deferred if they meet established standards of achievement, and may be further deferred after graduation because of family status, especially when the local board has accumulated a backlog of otherwise available and younger registrants.

Accordingly, it is to be expected that failure rates in current input samples will be greater than the rate implied by the percentile score of 10 on AFQT. Several studies have indicated that, if certain assumptions are made as to the failure rates among those portions of the civilian mobilization population not being ordered up for preinduction examination, the failure rate in current input may be corrected to approximately 10% of the civilian mobilization population (8.4%, Research Division, Classification and Survey Research Branch, Bureau of Naval Personnel, 1952; 10.9%, Merck and McMahan, 1957; and 9.7%, Karpinos, 1960).

CURRENT PROBLEMS

One assumption explicitly made in developing the psychometric definition of the mobilization population needs to be reexamined--the assumption that

Table 2

ESTIMATED DISTRIBUTION OF AGCT SCORES IN CIVILIAN POOL AVAILABLE FOR SERVICE AS OF 31 DECEMBER 1944

Source: Uhlaner, 1952

AGCT Standard Score	Proportion		Smoothed Percentiles	
	Interval	Cumulative	Original	Revised[a]
160 and up	.001223	1.000000	100	100
155--159	.000919	.998777	100	100
150--154	.002900	.997858	100	100--99
145--149	.006330	.994958	100	99
140--144	.011157	.988628	99	99--98
135--139	.020399	.977471	98	98--96
130--134	.027842	.957072	96	95--93
125--129	.056052	.929230	92	92--89
120--124	.068224	.873178	87	88--82
115--119	.078067	.804954	80	81--74
110--114	.097514	.726887	73	73--65
105--109	.084840	.629373	63	63--57
100--104	.085205	.544533	55	55--50
95--99	.079777	.459328	47	48--40
90--94	.069503	.379551	37	38--31
85--89	.061768	.310048	30	30--26
80--84	.052894	.248280	26	25--21
75--79	.045350	.195386	20	20--16
70--74	.039541	.150036	15	16--13
65--69	.029102	.110495	12	12--10
60--64	.025733	.081398	9	9--7
55--59	.020578	.055660	6	6--4
50--54	.013834	.035082	4	4--3
45--49	.008785	.021248	2	3--2
40--44	.012463	.013463	2	2--1

[a]Revised after original publication to provide smoother progression of percentile equivalents, particularly at operationally significant score levels.

the distribution of mental ability and the reference parameters would remain relatively unchanged for a number of years beyond 1944. Since then, the general population has grown and the age distribution has changed. The population appears to have become more mobile and increasingly urbanized. The length of formal schooling[3] and mass communication media have increased. Whether the distribution of underlying ability in the mobilization population has changed may be debatable. In any event, test performance could be affected in a number of ways: (1) by increasing the fund of general knowledge which could contribute to better performance in particular content areas, (2) by permitting better maintenance of levels of skills involved in the tests, and (3) by increasing general test sophistication and reducing the underestimation of ability likely to result from inadequate adjustment to test taking. The magnitude of such effects is not known; neither is it known whether such effects, if they exist, have served only to shift the distribution on the scale, or whether they have actually changed the shape of the distribution.

Another problem derives from the impact of the changing arts of warfare on the composition of the civilian pool declared as available by law and its implementation by the National Selective Service System. As a result of this impact, it may not be possible to assume that the distribution of AGCT scores in the military population of World War II is essentially similar to the distribution in the civilian pool now declared available by Selective Service. One instance will point up the problem: The need for larger numbers of the more able men both for military service and for civilian support may make it necessary to declare as available for military service certain classes of physically disabled not represented in the military population of World War II. In other words, the definition of the mobilization population as the civilian population available for service may prove too unstable for use as the reference population. Instead, it may be necessary to estimate the ability of the more basic population, namely, the population liable for service. Stated briefly, the required population is the Selective Service input, not the Selective Service output. The parameters of this input population are simple, few, and stable until changed by Congressional legislation: age, maleness, and citizenship or residency in the United States. In line with these indications of future research requirements, problems involved in testing large samples of Selective Service registrants, including deferred classes, are currently being explored.

Summary

Recent standardization studies have indicated the need to review the definition of the population base for which screening tests for military service are designed.

The sampling basis for establishing percentile scores on the Armed Forces Qualification Test (AFQT) was reviewed in detail as background for a statement of problems involved in arriving at the most realistic definition of the mobilization population in view of the manpower demands of current and future warfare. The conclusion was that the assumption that the distribution

[3] Accompanied, however, by a decrease in ability test score, presumably a result of "social promotion" practices. See Fuchs, 1957.

of general aptitude for military service in the mobilization population is the same now as when the standardization base was established in 1944 merits reexamination. The use of a more basic population, the civilian pool liable for service including deferred classes, may be necessary to provide the required stability of statistics for the standardization of screening tests.

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